

Considerations for Controlled Environments/Cleanrooms

Understanding how to create a high quality, integrated solutions to enhance quality and value of your Diptech printer







Quality

The proper controlled environment/cleanroom is a valuable and critical component in ensuring QUALITY.

The right controlled environment will:

- Improve product quality
- Create predictable product outcome/increase productivity
- Ensure compliance with manufacturers/client specifications





Primary Considerations for Cleanrooms

- HVAC- The Heart
- Architectural- The Body
- Controls- The Brains
- INTEGRATION





Glass Industry Controlled Environment Considerations

- General
- Temp/RH- See Specifications
- Cleanliness: Iso level

ISO 14644-1	.5 Microns	5 Micron	Feet Per Minute	Average Cost/Sq Ft Installed
5	100	29	90	\$300 to \$500
6	1,000	293	20	\$150 to \$250
7	10,000	2,930	10	\$125 to \$150
8	100,000	29,300	5	\$80 to \$125

- Diptech Specific Specifications
 - Temp 68 +/- 20
 - RH 50% +/- 10
 - Airchanges- 20 ACH
 - Fresh Airchanges- 8 ACH
 - Exhaust Air- 1200 CFM*
 - *Creates ACH of 8
 - Dryer Heat- 171,000 BTU**
 - **14 tons of cooling



HVAC

- 2 Primary System Types
 - Central (single) airhandler (AHU)
 - Split system- Make up air and Recirc
 - Recirc Systems
 - Cell Fans
 - Fan Filter Units (FFU)









Central Air Handling Unit (AHU)

One AHU to Provide

- Air Changes for Cleanliness
- Pressurization
- Latent Cooling
- Sensible Cooling

Pro's

- Conceptually Simple
- Fewer Motors/Overall Components

Con's

- Expensive
- Highly Energy inefficient
 - AHU static pressure
 - Duct pressure and losses
 - Installation



SPLIT SYSTEM HVAC The Cleanroom Industry Standard

- System 1- Make-Up Air (MUA)
- - Pressurization
- - Latent cooling
- System 2- Cleanroom Air
- Cell Fan or FFU
 - Air changes for cleanliness
 - Sensible cooling





Pro's

- Energy Efficient
- Cost effective
- Integrated design
- Modular
- Fast installation-start up

Cell Fan Kit

- *1. All in one solution for recirculating air for cleanliness air change requirements*
- 2. Includes:
 - 1. "Cell Fan"
 - 2. Terminal HEPA filters
 - 3. Air return
 - 4. Hardware

Con's

- More pieces than central AHU
- Less redundancy than FFU
- Height above ceiling





Fan Filter Unit (FFU) Integrated Component with 1. Fan 2. Housing 3. Hepa Filter 4. Pre-filter (optional)



Airtha

Con's

- Requires plenum for optimum efficiency/cleanliness
- More components to install
- Total Cost
- Complicated to create a "matched system" including supply, plenum and returns

Pro's

- Energy Efficiency*
- Redundancy
- Many options
- Packaging

Firthe

Architectural Components

- Key Considerations of air leakage and cleanability
 - Structural Support
 - Self supporting steel
 - Hung from Building
 - Ceiling System
 - Grid
 - Blank panels & other options
 - Walkable options
 - Panels
 - Walls-Windows-Doors & Openings
 - Stick built
 - Modular
 - Finish details
 - Flooring
 - Base concrete
 - Levelness
 - Floor covering
 - Epoxy
 - Vinyl



Controls

- Simple
 - Standard Thermostat
 - Integrated
 - Centralizes controls for multiple devices to control temp/pressure/humidity
 - Advanced Controls options
 - Remote accessability
 - Alarms
 - Reporting







Integration

The Integration of the HVAC, Architectural and Controls is as important to the function as the individual components

- Total design
 - HVAC coordination with architectural
 - Process and tool functionality
- Modern Modular Components make integration easier
- Critical integration areas
 - HVAC components with controls
 - HVAC with Architectural
 - Air supply and return paths
 - Architectural components
 - Ceiling to wall
 - Wall to floor
 - Doors/windows & other openings within walls



Integrated Modular Systems

Airtho's modular cleanroom designs create:

- Accurate and complete Quotes and Design
- Fast installation and start-up times
- Predictable Quality Control
- Future expansion & system updates/upgrades

Airtho Specializes in Modular components:

- Proprietary "Intelligrid ™" Ceiling System
- Proprietary "Cell Fan Kit ™ and Cell Fan Kit with Cooling ™" HVAC components
- Partnerships with modular structural steel & walls/doors providers.



Airtho- Cleanrooms for Diptech Printers







N-GLASS PRINTINC

- Airtho provides integrated Cleanroom kits for Diptech printers in the US
- Benefits:
 - Airtho provides well engineered cleanroom system for Diptech specifications
 - Single source responsibility for cleanroom operations
 - Modular Systems that offer faster installation, potential tax benefits.
- Standard kits
 - Integrated kit with complete HVAC, Architectural and Controls
- Options
 - Full self-supporting steel
 - Walkable ceilings
 - Advanced Controls